ALTERNATE WORK SCHEDULES- IS THIS THE ANSWER TO INCREASED EFFICIENCY, SAFETY, AND PRODUCTIVITY?

EXECUTIVE DEVELOPMENT

By: Gary Frazier
Fire Chief
Hutchinson Fire Department
Hutchinson, Kansas

An applied research project submitted to the National Fire Academy
as part of the Executive Fire Officer Program

May 1999

ABSTRACT

With the diversity of services offered, training requirements necessary, increased alarm loads, and the demand for efficiency and productivity by the public, it is necessary to constantly evaluate policies and procedures such as scheduling methods for efficiency, safety, and productivity. The problem was that the 24-hour work schedule for operations personnel in Hutchinson had not been researched or evaluated since 1969. The purpose of the project was to explore and evaluate optional scheduling methods and compare the results to the Hutchinson Fire Department's current schedule to determining if there is a more efficient, safe, and productive method for scheduling operations personnel.

This research employed both evaluative and action research (1) to identify the main factors that impact or effect shift schedules, (2) to identify the most common types of shift schedules used by fire departments and other emergency agencies for operations personnel, (3) to identify the pros and cons of alternate schedules comparing them to the traditional 24-hour shift. Current literature and interviews on scheduling methods, problems areas, factors that impact scheduling, and the pros and cons of each type of schedule, were used to gain information in evaluating the current fire service work schedule in Hutchinson.

Results of the information revealed a variety of factors that impact shift schedules such as cost, call volume, hours worked, productivity expected, safety and health issues, and legal requirements. The uniqueness of each department and the alarm load plays a significant role in determining the most efficient overall schedule. Although there are several alternate schedules being used in the fire service such as the 10/14, the traditional 24-hour shift continues to be the most popular and cost efficient. Productivity was found

to be only slightly less efficient with the 24-hour schedules, revealing little non-emergency productivity being accomplished, even with alternate schedules after 8:00 PM. Fatigue, which effects safety, is a concern with the 24-hour shift, however reports indicate the rotating schedule used with alternate schedules have a negative impact on the health and safety. In Hutchinson, the main concern with the current schedule is fatigue, not resulting from a large call volume, but from personnel working consecutive shifts without a break. Safety, efficiency in communication, and training, are also areas that can be improved by implementing changes to the current schedule or by changing to a 24/48-hour schedule. After evaluating all pertinent factors, the 24/48-hour schedule was found to be the most efficient, safe and productive schedule for operations personnel in Hutchinson, however a recent merger decision involving the fire department may delay implementation.

A two-phase plan for scheduling improvements and changes is recommended. Short-term recommendations will continue to utilize the current shift schedule and focus on improving fatigue caused by personnel working consecutive shifts by limiting the number of 24-hour consecutive shifts worked to three. Long-term recommendations to improve safety, communications, and scheduling of training activities, require implementing a change of work schedule from the current 24-hour "California" method to a 24/48-hour schedule.

TABLE OF CONTENTS

INTRODUCTION

In an era where productivity, working conditions, and efficiency are under scrutiny by public officials, city administrators, and the public, the fire service must continue to evaluate it's programs and operations for efficiency. One significant area where the fire service has maintained deep traditional roots and struggled to implement any change is in scheduling personnel. The uniqueness of fire department scheduling is a result of a long-standing tradition based on the need for 24-hour protection. With the expansion and diversity of services that the modern fire department are offering as well as constraints on budgets resulting from manning requirements, the question of what shift schedule is the most efficient continues to surface.

Concerns by officials about efficiency and productivity, safety and health considerations resulting from long shifts and overtime, and problems with scheduling training and communication among shift personnel, has prompted the need to evaluate the current work schedule for the Hutchinson Fire Department. Other questions related to the 24-hour shift include loss of productivity as a result of sleep time, expense for overtime, and additional facilities needed.

The problem in Hutchinson is that the fire department has not evaluated nor done any research since 1969 to determine the most efficient, safe, and productive method for scheduling fire operations personnel. The purpose of this research is to explore optional work schedules and evaluate them in comparison to the current 24-hour shift, to determine what scheduling method would be the most efficient, health and safety conscious and productive for operations personnel. As a result of the research and evaluation, recommendations will be made for the Hutchinson Fire Department to

improve or change the current shift schedule. Evaluative and action research methods were used to describe and evaluate the findings of this research.

Research was focused on determining the answers to the following questions:

1. What are the main factors that impact or effect shift schedules?
2. What are the most common types of shift schedules used by fire departments and other emergency agencies for operations personnel?
3. What are the pros and cons of alternate schedules compared to the traditional 24-hour shift?

BACKGROUND AND SIGNIFICANCE

Problems in scheduling emergency personnel to maintain 24-hour continuous coverage is not new to the fire service, however expanding role of fire departments coupled with a cry for efficiency by the public, continue to raise questions with traditional scheduling methods. Work schedules have evolved slowly from the days when a single compliment of firefighters ate and slept at the station in order to respond quickly. While management studies done during the industrial revolution in the U.S. produced significant changes in many occupations concerning employees, it wasn't until after W.W.I that schedules for firefighters was addressed. The average workweek was reduced to eighty-four hours by adding a second platoon (Bush and McLaughlin, 1979). Since that time, work schedules have evolved into a range of average workweeks between 40-72 hours for line employees, with a myriad of options.

Although the Fair Labor Standards Act (FLSA) was passed in 1938 to establish guidelines for employment conditions, it wasn't until the ruling in the *Garcia vs.*

Metropolitan Authority case in 1985, that the ruling was applied to public employees. (Rukavina, 1997). Legislation passed in response to the Garcia ruling included special provisions for firefighter compensation because of the unique nature of public safety positions. This ruling began to immediately have an impact on governing bodies by requiring time-and-one half overtime be paid for hours worked beyond a statuary maximum for eligible employees or compensatory time off given. In the fire service, a standard workweek is defined as 53 hours with a "work period" from 7 consecutive days to 28 days. Fire protection personnel are due overtime under such a plan after 212 hours worked during a 28-day period. (Department of Labor, 1999). Compliance requirements forced many local governments to develop means to eliminate overtime and/or reduce hours worked while trying to maintain the same level of service. A number of municipalities began to experiment with alternate staffing in lieu of the 24-hour shift.

As fire departments have evolved into a multi facet emergency organization, additional roles and responsibilities have changed and been added which has significantly increased the number of daily responses and fatigue placed on firefighters. In Hutchinson for example, a 20% increase in the call volume occurred from 1996-1997 as a result of a change in the department's Emergency Medical Response Policy (1998 Fire Department Report, 1999). Although the number of fire department responses to fires has steadily declined from 1977 according to a 1997 report from the NFPA, the trend has leveled off and has shown a slight increase form 1995-1996 (Karter, 1997). Fire departments involved in providing medical care are especially being challenged in scheduling personnel by the increased call volume to reduce stress, fatigue, and personnel welfare.

Other issue that must be considered when looking at alternate shift schedules that may impact the health and safety of personnel working shift work, relates to the body's biological clock, or circadium rhythms. Disruption of the bodies normal work/sleep cycle by rotating shifts may produce problems with chronic fatigue, depression and mood swings, intestinal ailments, chronic sleep problems, increased drug and alcohol abuse, and hypertension, according to a report by Dr. Debra Slapper MD (Slapper, 1998). The body's physiological clock can be changed, however Dr. Slapper's report indicates that it may take up to two weeks for the body to adjust to a new schedule which may impact the number of shifts in a row and shift length employees are allowed to work.

An increasing number of lawsuits against fire and EMS agencies may signal the need for the review of long standing work practices according to a legal alert sent out by the International Association of Fire Chiefs in 1996. In March of 1996, McDonald's was held liable by Oregon Court of Appeals, for damages in an auto accident caused by an employee who had worked unusually long hours (IAFC, 1996). Cases such as this illustrate the potential dangers and liability employers and possibly local governments may be faced with concerning extended work schedules or rotating shifts.

Training requirements for emergency personnel continue to increase and demand time during a scheduled shift. This creates additional time constraints and scheduling problems. Consistent department wide training is difficult when it becomes necessary to extend the training cycle to accommodate lengthily or rotating shift schedules. As fire departments expand their capabilities into fields such as hazardous materials and technical rescue, time to conduct additional training to meet new standards becomes a major problem. In 1998, as a result of the new Occupational Safety Health

Administration (OSHA) Respiratory-Protection Standard *29 CFR 1910 and 1926*, it was reported that a substantial impact and effect on a departments training program and operational procedures resulted as departments struggled to meet compliance requirements (Edwards, 1998).

Improving productivity is no longer just a fashionable concept- it's now a political and economic necessity (Fire Service Today, 1996). Lower taxes, less federal aid, and the public's demand for better service and reduced cost are a pressing challenge for the modern fire department. Most citizens seem satisfied with the current level of service, fire loss, and response times. The productivity that the public wants is a better use of existing resources (ICMA, 1996). The question of unproductive time personnel are sleeping during a shift even though they are on call, is a concern that arises any time productivity is discussed. Many officials believe that this time could be better utilized in training, inspection, and other duties by utilizing an alternate work schedule.

The Hutchinson Fire Department has worked the current modified 24-hour schedule utilizing a 3-platoon system since 1969 (K. Forbes, personnel interview, March, 1999). The average call volume based on 1998 statistics during a 24-hour shift was approximately 9 emergency responses. Operations personnel work a 24-hour shift, or 2916 hours per year, which averages a 56-hour workweek. To meet FLSA requirements, 12 hours of FLSA overtime is paid at ½ times the hourly rate of pay each 27 day cycle provided that there are no absences during the cycle. The 24-hour work schedule is as follows: Work/Off/Work/Off/Work/Off-Off-Off-Off. Specific concerns within the Hutchinson Fire Department related to the current 24-hour shift schedule that have prompted the need for a review and evaluation are concerns by administrators

concerning efficiency and productivity related to the 24-hour shift. This involves cost as well as the issue of time paid in non-productive work such as sleep time. Retirements and injuries the past three years have reduced department personnel levels to a point which has necessitated increased overtime and call back overtime for personnel. Health and safety concerns arise as a result of personnel working several shifts in a row without adequate time off to rest. If personnel work 24-hours of overtime or shift exchange, they may be on-duty a minimum of 72-hours. The current 24-hour shift schedule also presents problems associated with scheduling training and communicating with staff and line personnel when they are on their 4-days off at the end of a set. In some cases, it may take up to two weeks to finish a ½-day training cycle for the entire department.

The issue of efficiency, safety, and productivity required of fire departments and public organizations is not going to diminish. The biggest expenditure for fully paid fire departments continues to be employees. In order to be efficient, departments must continue to evaluate methods for scheduling personnel to ensure the greatest efficiency, safety, and productivity. Some departments have experimented with and been successful with the use of alternate shift scheduling. The information and exposure relating to the impact of an executive leader on changing the culture of an organization presented in unit 7 of the Executive Development Class at the National Fire Academy, was instrumental in evaluating and developing solutions to the scheduling concerns. Unit 10, relating to service quality marketing, also assisted in evaluating our current scheduling system in comparison to other methods to determine if there is a more efficient method.

LITERATURE REVIEW

Question #1

Research focusing on factors that impact or effect shift scheduling for emergency personnel revealed a great number of important factors that may influence how a department schedules personnel. Although some research is cited from different types of emergency agencies or organizations outside the fire service, most factors effecting scheduling are applicable to the fire service. The International City Managers Association, outlines seven factors that affect scheduling choices for the fire service (ICMA, 1988). These include the following:

1. Hours to be covered.
2. Negotiated agreements.
3. Employee fatigue.
4. Number of funded positions.
5. Actual hours of productivity expected.
6. Work load/demand per shift
7. State and federal mandates.

These factors, although not all inclusive, represent the most fundamental concerns associated with scheduling personnel. Specific factors effecting scheduling of personnel will focus on the financial impact, factors that effect health and safety, performance and productivity, legal aspects, and other employee factors.

The financial impact on an organization to implement any change in a shift schedule continues to be a major factor as communities attempt to downsize and maintain a hold on taxes. In an applied research paper, George Glenn suggests that labor costs in

career fire service consume 60-98% of a department's budget. Glenn further stated that schedules that average less than 50-hours per week often involved splitting into a 10/14 or a 12-hour shift increasing resource levels 20-30% (Glenn, 1992). Efficiency is often hard to evaluate in the fire service, but generally it also comes down to dollars and cents. Jim Budzinski of the Tamarack Fire Department, reports that financially providing the same number of employees becomes more expensive as the work hours are reduced (Budzinski, 1995). In a report by the International Association of Firefighters on the cost of paying overtime vs. reducing hours, it was found that the cost associated to reduce hours to 53 per week was 3% more than the cost to simply pay for overtime (IAFF, 1999). The basis of their analysis was the reduction from a 56-hour workweek to a 53-hour workweek.

In many cases, the cost to implement a shift schedule to reduce work hours may involve adding another shift or platoon, or adding personnel to cover peak times of the day. The total cost including employee benefits, which may exceed 30%, must be figured when evaluating what shift schedule is the most cost effective to reduce the length of a shift or as means of cutting overtime costs. In a 1976 report, *Scheduling Fire Service Manpower*, the option of increasing total department strength to maintain the same level of on-duty strength to accommodate a lower average duty week, was found to increase manpower cost and not fiscally possible in most cases (Heller, Stenzel, Gill, and Kolde, 1976). One of the disadvantages of a 24-hour shift cited by Dan Maurno in an article for The Fire Station Advisor, was that overtime is more expensive, however this assumption was based on theory that a shorter shift would require less over time costs. Retired Fire Chief Charlie Rule stated a similar fact when listing the advantages to the

10/14-hour schedule. Rule states that the cost to hire back a 24-hour employee is nearly double that of replacing an individual for either 10 or 14 hours (Rule, 1997). David Clark's research found that as a result of changing from the 8/40-hour shift to the 24/48-hour shift, that on-duty manning levels would be increased, staffing positions could be cut by three personnel, $80,000 in salary savings annually would result, and $35,000 in annual overtime would be saved for the Brentwood Fire Department (Clark, 1991). His report also suggested that the 10/14 shift offered neither a significant increase in salaries or increases in manpower over the 8/40-hour shift schedule for his department.

Shift work itself is not dangerous, however the workers themselves may become a liability to themselves, fellow employees, or their community, if they are not able to cope with the schedule. When evaluating shift scheduling and possible changes, a wide range of factors must be considered related to safety. The number of alarms during a shift and the resulting fatigue factor is a major problem that prompts departments to look at alternate shift schedules. Retired Fire Chief Charlie Rule, in and article for the American Fire Journal, expressed his concern with safety of personnel from fatigue resulting from multiple incidents during a 24-hour shift. He sites fatigue as one factor that should be considered for switching fire personnel to a shorter 10/14-hour shift (Rule, 1997). Timothy Monk, in his report on shift work and safety, illustrates an interrelated three factor model which includes the biological clock, sleep, and social/domestic factors that impacts safety of employees (Monk, 1989). Monk agrees with most reviews that weekly shift rotating shift systems are the worst, but believes there is still much controversy about whether very slow or very rapidly rotating shift systems are more viable alternatives.

A major factor that impacts shift work schedules and safety of employees results from the body's inability to immediately change its internal biological clock or circadian rhythms. In a report by Dr. Debra Slapper, she reported that several studies have shown that increasing the number of days between shift rotation and rotating clockwise can improve worker sleep, health, mood, and production, while decreasing accidents, drug use, and attrition from the job (Slapper, 1998).

In a study on the effects of shift work on firefighters and nurses, Linda Glazner determined that maladaptation and negative health effects did occur in some firefighters working shift work (Glazner, 1992). Glazner's research revealed similar results to studies conducted by More-Ede & Richardson in1985, in which shift-work was found to be disruptive to the eating, sleeping, and social habits of 10-20% of firefighters. Studies have found that nurses rotating night shifts, tend to have the most health complaints and perform less well on vigilance tests (Glazer, 1992). In a later study conducted with firefighters in three departments working a 10/14-hour shift, Glazer attempted to identify factors that contribute to injuries of firefighters. She found that as a result of shift work in firefighters that fatigue, especially on the night shift, and disruption of eating disorders resulted in increased injuries (Glazner, 1996).

In a report by Timothy Martin on the effects of rotating schedules on circadian rhythms of air medical crews, it was found that the circadian system influences performance through it's effect on metabolic functions and quality of sleep. He further stated that consistency in these body rhythms are crucial to the maintenance of normal levels of body function and performance (Martin, 1995). Research by Timothy Martin also indicated that mood swings, increased rates of divorce, gastrointestinal dysfunction,

infertility, and most important increased rates of errors and on the job injuries occur as these rhythms become out of balance.

In a report by Dr. Harold Thomas for the American College of Emergency Physicians, several factors were identified such as census and acuity of the department, number of night shifts in a row, and shift length, that should be considered in determining how to schedule a department and adapting to shift work (Thomas, 1999). His report identified two strategies used to approach scheduling. From a circadian cycle perspective, the standard is to never rotate shifts. The other strategy cited, that is often used in Europe, is to work as few a number of night shifts in a row to maintain a constant diurnal orientation (Thomas, 1999).

The hours of productivity and performance expected from an employee during a shift will have a major impact on scheduling and may effect not only the amount of work performed, but the quality of work as well. Most city administrators associate productivity with cost effectiveness. In theory, the 24-hour shift is seen as being inefficient in comparison to multi-shift configurations, which theoretically permit training and administrative activities to take place at night as well as during the day. In a study conducted by The Institute for Public Program Analysis, they found that as the number of alarms increase, the issue of sleep time concerning productivity becomes less of an issue (Heller, Stenzel, Gill, and Kolde, 1976).

The International City Management Association's book, *Managing Fire Services,* states that although there may be other advantages to a 24-hour shift, it unrealistic to expect personnel to work extended periods without a rest period. These rest periods decrease actual productivity by creating paid time when work is not being accomplished

(ICMA, 1988). Many administrators seem to agree with this philosophy in principal, however evidence to support the theory that alternate work schedules increase productivity during the proposed sleep time is limited.

In 1980, retired Fire Chief John Townley suggested the use of alternate scheduling to increase efficiency and productivity. His report suggested that the 8-hour schedule offers the greatest potential for efficiency, effectiveness, and productivity, although it's the strongest schedule opposed (Townley, 1980). He proposed utilizing an alternate schedule with rotating shifts and additional personnel assigned during peak times as an alternate method to improve productivity and cost effectiveness. In a bold departure from traditional scheduling in 1977, Kansas City, Missouri Fire Department initiated an 8-hour day, 40-hour work week schedule to maximize the on-duty time of firefighting personnel and make it more effective and efficient. Several advantages given for the shift change included fresh personnel every 8 hours reducing the exposure risk from long duty shifts, and a major increase in productivity in fire prevention activities (Harrell and Jewell, 1978). In a more recent article in Fire Service Labor Monthly, it was observed that Kansas City, Missouri has reverted back to a traditional 24-hour shift (ICMA, 1995).

Dr. Czeisler, the scientific founder of Light Services, contends that redesigning shiftworker's schedules to better fit the natural occurring circadium cycles can result in as much as a 25% increase in productivity and a 40% decrease in fatigue related accidents (Sheridan, 1991). Retired Fire Chief Charlie Rule suggests that to make fire departments more effective and productive, fire administrators should abandon the 24-hour shift in favor of a 10-hour day/14-hour night schedule (Rule, 1997). Rule suggests that

legitimate job-related assignments can be accomplished on the night shift between 6:00 PM and 10:00 PM, instead of a shut down of non-emergency productivity at 5:00 PM.

In a study, "Pay for time not worked", cited by National Fire Protection Association, three municipal fire departments examined revealed 53% of the time on duty involved periods they were not working (Grant and Hoover, 1994). In an applied research paper on manpower and scheduling in 1991, Fire Chief David Clark conducted a productivity analysis comparing the 8/40 and 24/48-hour shifts to determine if his department could be as productive with a sleeping shift instead of the 8-hour shift currently worked. His research found only a slight decrease in productivity between the two different types of shifts. Several significant disadvantages he observed with the 8-hour shifts that effected productivity included problems with effectively using non-suppressive work time with the night shift and scheduling difficulties (Clark, 1991). At NASA, job performance and general conditions improved during shuttle flights reducing jet lag and fatigue through a program focusing on scheduling, exercise, diet, and sleep (Westfall and McBride, 1998).

Legal issues involving mandates by bargaining agreements and state and federal agencies and liability concerns is another area that must be considered when evaluating work schedules. Consultants with Williams Learning Network suggest it is possible to implement alternative schedules and provide a win-win outcome for the employer and employees covered under union contracts by adjusting the base pay to make the process cost-neutral (Westfall and McBride, 1993). In Al Gillespie's research on shift schedules, he suggests that as a result of bargaining unit agreements, many fire departments that work a 24-hour shift are limited to 71/2- hours of non-emergency work per shift

(Gillespie, 1997). In New Zealand, the fire service is undergoing a significant restructuring change shifting their mission from suppression to prevention and education. As a result of the change, union contracts providing for 17.5 routine hours in the 42-hour work period need increased to at least 35 hours to enable more effort to be put into prevention efforts (Brown, 1997). The reason cited for the 18 months negotiations on the new roster relate to the increase of the productive work hours.

Legal problems are increasing as society learns more about the law and their legal rights. As a result, there is a steady trend toward finding governments liable and limiting immunities. In Kansas, the Kansas Tort Claims Act holds governing bodies to the same level of liability as any other citizen (P. Brown, personnel interview, April 1999). Concerning the liability of the 24-hour shift, Chief Patrick Kenny reported in response to an July 1, 1995 issue of *On Scene*, that his concern was with overtime and shift trades where personnel may be working up to 48 hours consecutively (IAFC, 1996).

Federal mandates such as the Fair Labor Standards Act (FLSA) has had a significant impact on the fire service. Although service delivery has not been impacted significantly, the changing of schedules and lowering of the workweek has had a significant impact necessitating increasing labor resources by 20-30% (Glenn, 1992). Provisions in section 7 of the act, recognizes the unique work schedules of firefighters and establishes this following standard: Overtime pay or compensatory time off must be given for any hours worked above 212 in a 28-day work period (Craley, 1989). Several provisions in the FLSA Act prevent governments from discriminating against employees entitled to benefits. One provision, which has been challenged in court on many occasions, eliminates the attempts by cities from lowering the base wage or excluding

meal and sleep time as compensatable hours. Sleep time can be deducted from the total hours worked if it meets the applicable DOL criteria and if an implied or expressed agreement exists between the employee and employer (IAFF, 1997). The City of Murfreesboro, Tennessee's argument, that concern for it's budget was the primary reason for a city resolution, was not held as a viable reason for not following the FLSA requirements by a District Court in Tennessee (Craley, 1989). Murfreesboro, Tennessee had lowered the base hourly pay for firefighters to save money as well as excluded three hours per day for meals to save money and comply with the requirements.

Provisions permitted by the 1985 FLSA Amendment for state and municipal governments does allow an exemption from overtime for persons meeting the criteria of administrative or executive capacity, and the ability to use to compensatory time to reduce overtime liability (IAFF, 1997). The persons within a department that are most effected are the first line supervisors which may include Lieutenants, Captains, and possibly Battalion Chiefs. Although the FLSA Act does not define the scope of executive and administrative exemptions, the Department of Labor (DOL) has adopted interpretive regulations defining the qualifications which include a salary, management, and duties test (Clark, 1998).

As with many federal laws, court decisions vary somewhat based on the federal circuit that the fire department is in and how the courts construe the provisions and apply them to various departments. While the impact of legislation and liabilities may be burdensome and costly, failing to comply or make necessary changes by local governments may be more costly in terms of lawsuits and settlement. Also, as departments expand their role into the medical field, the line that separates the 7K

exemption for public safety functions within the FLSA Act may no longer serve as a basis for the exemption (Krakeel, 1997)

Other factors that should be considered when evaluating the type of shift schedule for an organization include areas that impact employees such as morale, family time, and commuting issues, to name a few. In an information poll taken of several Boston-area fire departments, morale was cited as the key benefit to the 24-hour shift (Maurno, 1996). Deputy Chief Raymond Rose of the Elk Grove Police department after completing an evaluation of the effects of scheduling on his department, agreed with most literature suggesting rotating shifts cause stress and other negative effects on the body effecting the employee's productivity, attitudes, and health (Rose, 1991). Personnel dissatisfaction by changing shift schedules may have a negative effect on department morale by increasing sick leave usage, a higher turnover rate, and less productivity. Chief Hewitt, when discussing "sacred treasures" of the fire service, included established work shifts, beds in the fire stations, compressed work weeks, the ability to change shifts with others, and the no work times, as areas that add no value to service but do add quality to the firefighters work life (Hewitt, 1995).

Question #2

Additional research focused on the most common types of shift schedules used by fire departments and other emergency agencies. Information revealed many departments continue to use some form of the traditional 24-hour shift, although there are many variations. Several alternate schedules have been tried or are currently being used such as the 10/14, 12/12 and 8-hour shifts. According to a recent report by the International Association of Firefighters (IAFF) on hours and schedules, the 24-hour shift continues to

be the most commonly used schedule among paid firefighters accounting for 67.66% (IAFF, 1999). The second most frequently worked shift schedule was a 10/14-hour shift accounting for 28.65%. The 42 hour work week shows the greatest percentage of use for the fire service, according to IAFF's 1999 report, showing 29.4% (IAFF, 1999). Although the 56 hour workweek was once the most popular, it now ranks second with 28.34% usage rate in the latest report. In an applied research paper, Jim Budzinski identified several alternate schedules to the 24-hour shift. One of the most common alternative schedules found in the fire service was a 9 or 10-hour shift followed by a different crew working either 14 or 15 hours. This was repeated in a 2,3, or 4-day cycle (Budzinski, 1995)

The 8-hour shift is an alternate shift schedule that will satisfy the 24-hour requirement for maintaining service and reduce the number of hours to 40 per week, but little information on use by the fire service was found. 8-hour shifts has been used successfully by industry, but has seen relativity little practical application in the fire service (Budzinski, 1995). Earlier studies completed in the late 1970's revealed 2% of the fire departments in the United States used three 8-hour shifts per day (Heller, Stenzel, Gill, and Kolde, 1976). A review of the IAFF's 1999 schedule report did not reveal any departments currently working 8-hour shifts, however Don Hill indicated in his survey of 53 fire departments that one department indicated they worked a 8-hour shift schedule (Hill, 1997). Emergency dispatchers are a group that appear to favor the 8-hour shift, however some report using a 10 or 12-hour shift or some combination to keep minimum staffing levels (Burton, 1995). Emergency Communications personnel are looking at alternate methods for give dispatchers additional rest time, but a shortage of personnel

has been a hindrance. Although research was limited, it appears most police departments, such as the Elk Grove, Illinois Police Department, work a 3-shift, 8-hour schedule (Rose, 1991).

A popular European scheduling method being used is the "very rapid rotation system" which uses a rotating 8-hour cycle. Air Traffic Controllers in the United States now work a version of this system (Westfall and McBride, 1993). This schedule includes 2-evenings/2-days, /1-graveyard (including 2 hurry-back shifts), then 80 hours off.

An informal interview was conducted at the National Fire Academy in January of 1999 with officers in the Executive Development class, to determine what type of shift schedule other departments worked. Information revealed that the 24-hour shift was the most prevalent used schedule, however many variables existed. Variations in the 24-hour shift were seen concerning the number of hours worked, cycle length, and the number of "Kelly-days" used. A 12 or 24-hour shift off often called a "Kelly-day", is used by many departments to reduce the hours worked in a cycle. Other unique variations of the 24-hour schedule are being used such as the schedule used by the Norfolk Fire and Rescue Services. They work a 24-hour shift on a 21-day cycle with crews rotating fire and medical responsibilities after each 12 hour period (Norfolk Fire and Rescue Services, web page, 1999). Following each Wednesday is a five daybreak with scheduling starting over the following Tuesday. Another variation of the 24-hour shift used in Washington, DC for their fire service allows 72-hours off after working a 24-hour shift (T. Herlihy, personal interview, January 1999). This schedule utilizes a 4-platoon system. Three of the most common 24-hour shifts that are currently being used include the following:

Chicago Plan- *24 on/24-hours with varying days off*, California **Plan**- *24 on/24 off/24 on/24 off/24 on/96-hours off,* and the **Modified**- *24 on/48-hours off with Kelly-days*.

Eight fire departments in close proximity to Hutchinson were contacted by phone to determine the most prevalent shift schedule used for operations personnel (Forbes, 1999). The cities contacted were chosen based on similar size of their department to Hutchinson, equal population, and because these were cities jointly chosen by city administration and unions for a recent salary study. Results of the conversion with a representative from each fire department, revealed that Jefferson City, Missouri, Manhattan, Kansas, Emporia, Kansas, and Lenexa, Kansas work the same 56-hour modified 24-hour schedule that Hutchinson is currently working. This 3-platoon system is as follows: *Work/Off/Work/Off/Work/Off-Off-Off-Off.* Joplin, Missouri and Salina, Kansas both work a 3-platoon 24/48-hour schedule, which averages 56 hours per week. Grand Island, Nebraska also works a 24/48-hour shift, but uses a Kelly-day every 90 days to reduce FLSA overtime. Leavenworth, Kansas works a modified 24-hour shift with a Kelly-day every 54 days. Leavenworth's three-platoon 54-hour week shift schedule is as follows: *Work/Off Work/Off-Off-Off then repeat.*

Reno County Emergency Medical Services (EMS), which provides advanced life support (ALS) and transport services to Hutchinson and Reno County, is one of the few medical response services in this area that has not changed schedules to a 12/12-hour shift. With a call volume of 11 runs per day, they are currently working a 24-hour shift (R. Miller, personal interview, May 1999). Miller stated that Sedgwick County EMS, which is a neighboring EMS service to the east of Hutchinson, switched to a 12/12-hour

schedule from a 24-hour schedule several years ago as a result of an increased call volume.

The 10/14-hour shift schedules is becoming more popular as fire departments address shortened shift schedules, productivity concerns, and the fatigue factor from long shifts. Retired Fire Chief Charlie Rule suggests that the 24-hour shift schedule should be abandoned in favor of the 10-hour day and 14-hour night schedule. Rule suggests a 24-hour off period at the end of the day cycle prior to commencing the night cycle (Rule, 1997). The off-duty cycle depends on which overall cycle (i.e. 12, 9, or 6 days) is selected. This type of 10/14-day shift schedule can be administered with a three-platoon system without adding a fourth -platoon, provided a 56-hour workweek is utilized. A nine-day cycle for example will include 3-days/3-nights/ 3-days off. Variations of this schedule can be used which include 9/15, 11/13, or the 12/12. In order to decrease the number of hours worked per week using a 10/14-hour schedule and ensure adequate personnel are on duty, an additional platoon must be added. In an interview with Assistant Chief Stephen Leinoff of Hartford Emergency Services, he advised that in order for their department to utilize the 10/14-hour schedule and reduce hours to 42-hours per week, it was necessary to add a fourth-platoon (S. Leinoff, personal interview, January, 1999).

The 12/12-hour schedule is utilized by some fire departments and other agencies such as emergencies medical services (EMS) for operations personnel. The Salem Department of Fire and Emergency Management protects a population of 25,000 and utilizes a four-platoon 12-hour shift to staff three stations of engines and paramedic transport units (Salem Fire Department, web page, 1999). Emergency medical service

(EMS) personnel in the Washington, DC area work the following 12-hour schedule: Two 12-hour days/ two 12- hour nights/ four days off (T. Herlihy, personal interview, January 1999). Some EMS departments, such as the City of Cleveland EMS, have experimented with a 12-hour shift schedule to address issues of stress. It is interesting to note, that a study conducted with their department to determine if a reduction in stress resulted from a scheduling change to a 12-hour shift, did not show declining levels of stress (Cydulka, Emerman, Shade, and Kubincanek, 1994). Traditionally, physicians are another group of medical care professionals that have worked two primary shifts of 12-hours (Thomas, 1999).

Question #3

Research was conducted to determine the pros and cons of alternate shift schedules in comparison to the traditional 24-hour shift. There are differences in each type of schedule such as time off between shifts, hours worked, and rotation that effects each department differently. Although authors opinions may differ on each type of schedules for a variety of reasons, the basic advantages and disadvantages of the 24-hour, 10/14-hour, and the 8/40-hour shifts will be outlined. As a result of differences with individual departments in call volumes, hours worked in a cycle, and other associated factors, what some see as an advantage to a schedule, others may see as a disadvantage.

The 24-hour shift continues to be the shift of choice for fire service personnel for a variety of reasons although tradition may be the most prominent factor. In an informal poll of Boston area fire departments, Dann Maurno cited “morale” as the key benefit of the 24-hour shift (Maurno, 1996). He described unit cohesion and teamwork that is developed as crews spend a considerable amount of time together as another benefit of

the long shift schedule. The shorter work week schedule allows firefighters to not only work a second job, but also allows for two working parents to manage child care easier during the day (M. Miller, personal interview, April, 1999). According to Maurno, the 24-hour shift should make for fewer sick days and personnel days, if the law of averages are applied. With a shorter workweek, 24-hour personnel that are on sick leave would have additional time to recuperate, however the downside is that two shifts off in a week would require more sick leave than five 8-hour days. In a report by David Clark, he agrees that a 24-hour shift can be fatiguing to firefighters and also suggests that a 24-hour schedule may encourage a greater commitment to other jobs and requires sleeping quarters (Clark, 1991). He also suggested many additional advantages to the 24-hour shift schedule such as increased manpower levels, increased programs such as training and physical fitness, less time commuting, simplified scheduling, more time for recovery after a shift, and ability to trade shifts reducing sick leave abuse and overtime (Clark, 1991). Although in most cases, the 24-hour shift is more cost effective, a 10/14-shift schedule on a 56-hour workweek can be adapted without the need for a fourth platoon. A 9-day cycle 10/14-hour schedule with 3-days/3-nights/ and 3 off is suggested by Rule (Rule, 1997). The 24-hour shift however does allow for a 3-platoon system to be used which can be modified by the use of "Kelly-days" to reduce overtime hours required by the FLSA.

Charlie Rule suggests that the 10/14-hour shift not only provides a reduction in sick leave and overtime, but increases productivity and eliminates the complaint that 24-hour absences are not conducive to a family life (Rule, 1997). The major benefit of the 10/14-hour schedule is that it reduces the hours of work per shift resulting in reduced

stress and fatigue. Fatigue is an element in safety according to Rule, and the 10/14 hour shift provides more rest and energy restoration than the 24-hour schedule. Additional time with the family is another factor often included with the benefits of a shortened shift schedule. In many cases a disadvantage to an alternate schedule such as the 10/14 or 8-hour shift is that it will increase employer costs by the addition of an additional platoon (Glenn, 1992). In retired Chief Charlie Rule's article on alternatives to the 24-hour shift, several factors such as the trauma caused by societal changes and the firefighters complaint of additional drive time, were suggested to be disadvantages to a 10/14-hour shift (Rule, 1997). Brentwood, Tennessee Fire Department disregarded a possible change from an 8-hour schedule to a 10/14-hour shift, citing neither significant salary savings nor manpower increases (Clark, 1991). Instead they opted for a 24-hour schedule citing elimination of duplication, stability, and enhanced training and physical fitness programs as reasoning (Clark, 1991).

In Dann Maurno's article on the 24-hour shift, the two disadvantages cited were overtime can be expensive and that a full day of calls can be physical demanding (Maurno, 1997). Although FLSA overtime expenses can be incurred in any schedule depending on the cycle, a 24-hour shift costs more to maintain than a shorter shift length. Retired Fire Chief Charlie Rule agrees that the 24-hour shift may increase the chance of a fatigue related injury resulting from multi incidences during a shift (Rule, 1997). Although shorter shift lengths are an advantage for departments experiencing heavy work loads, issues and problems related to additional shift changes per day, transfer of personnel between shifts, additional commuting time necessary, and the fatigue as a

result of rotating schedules are problems that arise (Heller, Stenzil, Gill, and Kolde, 1976).

Another negative perception that many governmental leaders have concerning the 24-hour schedule which promotes the 10/14 schedule, is a loss of productivity as a result of sleep or stand-by time. Studies do not support the same conclusion relating to productive time as was once suggested. In a 1976 guide to fire service scheduling, it was found that with increasing alarm rates, standby activities represented a less proportionate time of each shift (Heller, Stenzil, Gill, and Kolde, 1976). Charlie Rule implies that legitimate job related assignments such as training, code-enforcement, and maintenance, can be accomplished by crews between the hours of 8:00 PM-8:00 AM increasing the daily productivity of crews (Rule, 1997). John Townley suggests that most activities including pre-fire plans can be best carried out between the hours of 9:00 AM-8:00 PM, although some inspections on bars, discos, and nightclubs, need inspected during the time when they are most crowded (Townley, 1980).

Although there is limited use and information on the 8-hour shift in the fire service, it has been widely used in industry. Benefits for the fire service may include a larger and more easily called back reserve force of off-duty firefighters, an increased ability to train due to the scheduled time a firefighter is on duty, less fatigue, due to the reduced time on duty, and the increased perception of productivity by the public (Heller, Stenzel, Gill, and Kolde, 1976). Disadvantages of the 8-hour shift may include increased cost, administrative and scheduling problems associated with 3 shifts per day, commuting time increase, frequent shift rotations required, and disruptions to a firefighters family life. In a report by David Clark, he suggested that changing from a 8-hour shift to a 24-

hour shift would improve manning levels while reducing significantly employee salary and benefit costs for the Brentwood, Tennessee Fire Department (Clark, 1991).

PROCEDURES

Definition of Terms

Platoon- The working group necessary to staff a given period of time or schedule. Depending on the type of schedule, from one to four platoons may be used during a 24-hour period to maintain staffing.

Shift- A division of fire department personnel into working groups during a given period of the same time each working day unless a schedule rotation occurs.

Cycle- The number of hours worked in a given time schedule. FLSA determines the maximum number of hours worked in a given period before employers are required to compensate employees for overtime.

Limitations

In evaluating shift schedules, it is difficult to develop measurable comparisons with the variety and variations of schedules used by fire departments. A quantitative method for comparing effectiveness, safety, and productivity of other shift schedules to the Hutchinson Fire Department's 24-hour schedule was limited based on research material. Results and information used to compare schedules were based on information gained from other fire departments, agencies, and authors opinions. Cost outs and productivity studies were not found or used except where noted.

This research project employed evaluative and action research methodologies to identify the key factors involved in scheduling, determining current scheduling methods

used by emergency agencies, and identify the pros and cons of the three basic schedule types. The current shift schedule of the Hutchinson Fire Department was evaluated with the results of the research to determine if there is a more efficient, health and safety conscious, and productive means for scheduling operations personnel. Results and information gained by the project will be the basis for recommendations for improvements to the current scheduling system. Interviews were conducted with other fire and medical departments as well as extensive research of current literature from the International Association of Fire Chiefs (IAFC), International Association of Firefighters) IAFF, the National Fire Academy's Learning Research Center, internet information, and information gained through the local Interlibrary Loan Program. The literature review targeted trade journals, applied research reports, internet reviews of other departments and agencies, and books on management that address issues relating to shift scheduling. Because current literature was limited in certain areas, articles dating back to 1976 also were used to gather information. Because of differing opinions on the issue of shift schedules in the fire service, every effort was made to keep an open mind on the subject. Recommendations for improvements and options for consideration to the current shift schedule are listed in a memo to the union and city manager (see Appendix A).

RESULTS

Question #1 *What are the main factors that impact shift schedules?*

Research indicates a diversity of factors that effect scheduling efforts. Cost or the financial impact continues to be a major factor when considering changes to a shift schedule as labor costs consume the majority of most budgets. Consideration must be

given to the financial impact associated with overtime, reduction of work scheduled hours, and additional manpower requirements. Work schedules that average less than 50-hours per week often require the addition of an additional platoon which may increase resource levels 20-30%, according to George Glenn. The IAFF determined that the cost associated in reducing overtime hours from 56-hours per week to 53-hours was 3% more than the cost to pay for the additional overtime (IAFF, 1999). Although the 8-hour shift was found to be more expensive to accommodate than the 24-hour schedule, a 10/14-hour schedule could be utilized with a 56-hour week on a 9-day cycle with the current three platoon system reducing overtime costs (Rule, 1997). Because of the length of the shift, overtime costs associated with the 24-hour shift were considered higher than either alternate schedule, however Rule's report suggested that cost savings associated with a change to a 24-hour shift were significant for his department (Rule, 1991).

Health and safety of employees is another factor that impacts methods for scheduling employees that research revealed. Length of shifts, rotation of shifts, and fatigue that result from the number of calls per shift, are factors that must be considered when evaluating shift schedules. The fatigue factor related to the traditional 24-hour shift is a concern for departments that have a high call volume that has prompted some to consider a shorter schedule such as the 10/14 or 12/12-hour schedule. Research conducted by Linda Glazer revealed that shift-work disrupted eating, sleeping, and social habits in firefighters as well as increased injuries as a result of fatigue. Studies indicated that increasing the number of days between shift rotation could improve worker sleep, health, mood, production, and decrease accidents, drug use and attrition. Short-term shift

rotations were found to have detrimental effects on employees as a result of the body's inability to change its internal biological clock or circadian rhythms.

Productivity, or the perception of a lack of productivity during a shift, continues to be a concern by many leaders when evaluating shift schedules. Although the 24-hour shift is considered by many to be inefficient due to sleep time, research was inconclusive as to whether or not a significant increase in productivity would result from the use of alternate schedules. Even with alternate schedules such as the 10/14 or 8-hour shift, little additional productivity was observed after 10:00 PM except inspections of bars and clubs. In addition a lack of productivity was suggested with the shortened schedules resulting from multi scheduling daily and non-suppressive activities with the night shift (Clark, 1991).

Liability, federal mandates, and local bargaining agreements, are other factors that have indicated an impact on shift schedules. The FLSA rulings have caused many departments to address the overtime liability by the reduction of their workweek hours, giving compensation time, deducting for sleep time, or reclassifying administrative or executive personnel as exempt personnel. Although concerns were raised by many fire administrators about the liability relating to the 24-hour shift where personnel are working extended lengths of time, no information regarding actual litigation was found in the fire service. A court case involving McDonalds, did however find the company responsible for employees extended work schedule (IAFC, 1996). It was found that in several cases, bargaining agreements limited the number of non-emergency hours that could be spent in a work period.

Other factors that effect employees and their families and indirectly impact scheduling decisions include morale, commuting issues, and family time. While morale was not indicated by research to be a factor, morale was cited as the key benefit in the 24-hour shift (Maurno, 1996). Commuting concerns regarding additional drive time associated with shortened schedules and family time were other issues mentioned.

Question #2 *What are the most common type of shift schedules used by fire departments and other emergency agencies for operations personnel?*

Research indicated that most fire departments (67.65%) continue to utilize some form of the 24-hour shift, however there is a wide variety of scheduling methods. The 42-hour workweek is now the most prominent schedule in the United States replacing the 56-hour workweek according to recent IAFF study. The three most common types of 24-hour schedules found were the Chicago Plan (24 on/24-hours off with varying days off), the California Plan (24 on/24 off//24 on/24 off/24 on/ 96 off), and the Modified Plan 24 on/48-hours off with Kelly-days). Of the eight cities contacted in close proximity and equal size to Hutchinson, 50% of their fire departments worked the same 24-hour schedule as in Hutchinson. The majority of the rest of the fire departments work a modified 24/48-hour schedule.

There are several fire departments that are successfully using a split shift such as the 10-14 or 12/12-hour shift, but the majority of emergency services using this schedule are either a combination fire/EMS department or separate EMS transport services. Fire departments that are heavily involved in the EMS field, such as Washington, D.C., favor a 12-hour shift to reduce stress in personnel. Other emergency response agencies who are using the 8-hour shift involve, police, dispatching, and hospital care providers. The

8-hour shift has proved effective in industry and has recently been modified using a "very rapid rotation system" by air traffic controllers. Little research was found indicating successful current use by fire departments with the 8-hour shift schedule.

Question #3 *What are the pros and cons of alternate schedules compared to the traditional 24-hour shift?*

In comparing the pros and cons for alternate shift schedules to the 24-hour schedule, it was found that although the 24-hour schedule was the most cost efficient, except where a 56-hour week, 10-14-hour schedule, was used (Rule, 1997). As the workweek is reduced, the 10/14-hour schedule's cost efficiency is reduced by the necessity of the need for an additional platoon. Cost for overtime with the alternate schedules is less due to the number of hours worked. Increased fatigue levels are a concern with the 24-hour shift, but are prevalent with departments having experiencing heavy call volumes. Shorter shift schedules such as the 10/14-hour schedule reduce stress and improve the fatigue factor resulting from an increased alarm load, but research indicates that other physical and sociological problems associated with rotating schedules may occur. Research indicates that rotating schedules associated with shortened shift schedules may have a negative impact on productivity, efficiency, and health and safety of the employee (Martin, 1995).

With increased time off time during the week with a 24-hour shift, it was suggested in an interview with Battalion Chief Miller, that family time and childcare could be more easily distributed with a two parent working family. Clark suggested that longer shift schedules such as the 24-hour shift may encourage a greater commitment to off-duty jobs, but reported that it will increase training and physical fitness programs,

require less time commuting, more time for physical recovery, and the ability to change shifts reducing sick leave abuse (Clark, 1991).

Although increased productivity was suggested by Charles Rule in areas of code enforcement, training, and maintenance, resulting from a change to a 10/14-hour shift from a 24-hour shift, evidence was not found that supported a significant increase in productivity between 8:00 PM and 8:00 AM. Townley suggests that most non-emergency activities, except inspections at clubs and discos, are best carried between 9:00 AM and 8:00 PM (Townley, 1980). In a productivity analysis conducted by Chief David Clark, he found that there was only a slight difference in productivity between alternate schedules such as the 8-hour shift and the 24-hour shift (Clark, 1991).

Additional problems were also found with shortened shift schedules such as reduced morale, disruption of family life, concern for increased commuting, and additional problems related to multiple shift changes per day. Comparison of the 24-hour shift to the 8-hour shift revealed little practical benefits for the 8-hour shift because of additional personnel requirements, increased cost, scheduling difficulties with three shifts per day, and the safety and health concerns related to rotating shift schedules. Clark indicated that as a result of changing to a 24-hour shift from an 8-hour schedule, that manning levels would be significantly increased while reducing salary costs significantly (Clark, 1991). Little research was found identifying specific problems associated with 24-hour shifts relating to scheduling problems for training or communications among crews except for problems associated with Battalion or Division Chiefs.

DISCUSSION

The focus of the research was to determine the most efficient, safety and health conscious, and productivity type of schedule for Hutchinson. After considering factors that effect scheduling, the variety of schedules used by organizations, pros and cons of each shift type, and specific elements within our organization, it was that concluded that there may not be a "best" schedule. Each department must evaluate their scheduling needs based on many factors in determining the most efficient overall schedule. Evidence suggested this might be the case by the vast numbers of differing schedules within the fire service.

Research indicated there were three basic types of shift schedules available to cover a 24-hour period. These include the 24-hour schedule, a split shift schedule such as the 12/12 or 10/14-hour shift, and a three platoon 8-hour shift. The single shift 24-hour schedule continues to be the most popular shift among the fire service, with three prominent 24-hour schedules. There is wide variety of shift cycles and hours used.

Although several authors believed that the 24-hour shift was not efficient or productive, conclusive evidence was not found that supports this. If a 56-hour schedule is used for either the 24 or 10/14-hour schedule, the cost to operate appears to be similar. Many departments however have reduced the scheduled work hours to a point where it would be necessary to add an additional platoon if an alternate schedule such as the 10/14 was used, increasing the cost significantly. The Brentwood Fire Department found significant cost benefits in switching to a 24/48 schedule after evaluating other methods (Clark, 1991). Information from the IAFF, indicated it was cheaper to pay overtime than reduce hours worked (IAFF, 1999).

There was a perception by many administrators of inefficiency and non-productivity related to the 24-hour schedule, however opinions varied on how much additional productivity could be gained by alternate shift schedules. A productivity study revealed little additional benefits from alternate schedule and in fact most sources reveal little non-emergency work would be done after 8:00 PM, except for inspections of bars and clubs. Other factors such as "morale" relate to productivity and efficiency that may be a factor worth considering.

Research indicated that fatigue, which influenced the safety of personnel and equipment was a concern for personnel working the 24-hour shift, however the call volume and type of 24-hour shift schedule are important factors. The 10/14 or 12/12-hour shift is gaining popularity as a method used to reduce fatigue by reducing hours worked, however medical research indicates that the body's biological clock is disrupted by the use of a rotating schedule. Fire department who have an integrated EMS system appear to be experiencing fatigue as a result of the increased volume of calls. Rotating shift schedules necessary for alternate schedules such as the 10/14, was not recommended by health care professionals because of the adverse effect on the health and psychological well being of employees.

The perception of liability by many departments was a concern especially with the 24-hour schedule as a result of personnel working long and extended shifts. Although research revealed some recent litigation toward employers in the private sector, no cases in the fire service specifically relating to scheduling were discovered. This change in responsibility may indicate the need for emergency managers to begin considering their responsibility for fatigue and its effect on personnel.

The 24-hour shift schedule in Hutchinson appears to be the most efficient and cost effective, however the type of 24-hour schedule used may be in question concerning safety and efficiency. An alternate scheduling method such as the 12/12, 10/14/ and 8-hour shift did reveal some benefits for departments that have a large call volume, but in most cases the cost involved and related health factors does not indicate additional benefits worth while. Although some research indicates the potential for increased productivity from an alternate shift, little additional benefits could be found in Hutchinson. In evaluating the current 24-hour schedule worked by our department, it was found that the day-on/day-off and the 4-days off at the end of a set of shifts reflect several problem areas unique to this type of schedule. These include requirements for long time frames to complete scheduling training cycles and problems communicating information to personnel on their 4-days off. The current schedule also lends itself to additional fatigue for employees when overtime is worked. Fatigue, is not totally the result of the call volume per shift, but the extended work hours (at least 72-hours) when a shift exchange or callback overtime is necessary. Research did not indicate specifics concerns or benefits related to any of the 24-hour schedules, but local issues in Hutchinson would suggest a need to look at the 24/48-hour schedule (1-day-on/2-days off) for possible improvements. The 24-/48-hour method allows better scheduling possibilities for training reducing the time necessary (half-day training cycle could be completed in 3-days). Communication could be improved to operations personnel as a result of officers and crews working every third day. The issue of safety could be improved as a result of the two 0day rest period after working a shift or if a shift exchange or overtime occurred, only 48-hours would have to be worked.

RECOMMENDATIONS

Based on the research of factors impacting shift schedules, alternate methods, evaluation of pros and cons, and the evaluation of the current 24-hour shift schedule, it was found that efficiency and safety could be improved. A significant cost savings or increase in productivity was not found to be a factor with any of the alternate schedule types over the 24-hour schedule. Concern for fatigue is not the result of the current alarm load, but the result of overtime increasing time worked from the 24-hour "California" scheduling method. The issue of potential fatigue needs immediate attention. As a result of a merger with Reno County Fire District #2 effective January 1, 2000, a short term and a long term recommendation is suggested. With the changes required with the upcoming merger, a shift schedule change is not recommended until the merger transition is completed.

A short term adjustment in the current 24-hour schedule will address the issue of safety resulting from overtime and shift exchange by limiting the number of shifts, but will not offer viable solutions for problems with communications or scheduling training. Extra effort by staff and administration will be necessary to assist these areas. The long-term solution to efficiency, productivity, and health and safety concerns, will involve changing to a 24/48 schedule. This schedule allows will make improvements in fatigue concerns and improve scheduling and communication problems.

Short Term

- Continue to utilize the current modified 24-hour schedule.

- Modify the current “Call Back” and “Shift Exchange” policies to limit the number of consecutive shifts personnel can work to 3-shifts, based on the concern for personnel safety.
- Battalion Chiefs will monitor fatigue levels of personnel working call back or overtime and make changes when necessary.
- Increase communication among operations personnel by utilizing weekly written staff notes to the Battalion Chiefs.
- Attempt to schedule training when possible at times crews work three consecutive days.
- Address issue concerning the limitation of overtime and shift exchange.

Long Term

Review and evaluate the results of the short-term recommendations for effectiveness.

- If the evaluation reveals continued concerns in any of the areas, change the current modified 24-hour shift schedule to a 24/48-hour schedule.
- Address the issues involving a change of schedules.

REFERENCES

Brown, M. (1997, January). A new fire service for New Zealand. *Fire Chief*, pp. 35-40.

Budzinki, J. (1995, March). *24-hour shift-acceptable service delivery*. (Applied Research Project). Emmitsburg, MD: National Fire Academy, Executive Fire Officer Program.

Burton, A. (1995 January/February). Schedules, schedules, and more schedules. *9-1-1 Magazine*, p.19.

Bush, L. S., McLaughlin, J.H. (1979). *Introduction to Fire Science*. (2nd Ed.) Encino, CA: Glenco Publishing Co., Inc.

City of Hutchinson, Kansas, Fire Department. (1999). *1998 Annual Report*. Hutchinson, KS: Author.

Clark, D. H. (1991, February). *Manpower and scheduling*. (Applied Research Project). Emmitsburg, MD: National Fire Academy, Executive Fire Officer Program.

Clark, R. K. (1998, January). Fair Labor Standards Act: White-collar exemptions as applicable to fire departments. *Fire Engineering*, pp. 107-109.

Coleman, R. J., Granito, J. A. (Ed.). (1988). *Managing fire services*. (2nd Ed.) Washington DC: International City/County Management Association, pp. 173-177.

Craley, M. D. (1989, December). FLSA compliance: Cities find it too costly not to abide. *Fire Engineering*. pp. 70-71.

Cydulka, R. K. MD, Emerman, C. L. MD, Shade, B., Kubincanek, J. (1994, May/June). Stress levels in EMS personnel: A longitudinal study with work-schedule modification. *Academic Emergency Medicine*, Vol. 1 No. 3.

Forbes, R. K. (1999, April). *Report on shift schedule information.* Hutchinson, KS: Author.

Gillespie, A. H. (1997, August). *The sunset of the twenty-four shift.* (Applied research Project). Emmitsburg, MD: National Fire Academy, Executive Fire Officer Program.

Glenn, G. A. (1992, January). *The impact of the Fair Labor Standards Act upon firefighters work schedules.* (Applied Research Project). Emmitsburg, MD: National Fire Academy, Executive Fire Officer Program.

Glazner, L. K., (1992, July). Shift work and its effect on firefighters and nurses. *Occupational Health and Safety,* pp.43-47.

Glazner, L. K., (1996, May). Factors related to injury of shift-working firefighters in the Northeastern United States. Safety Science 21, pp.255-262.

Grant N. K., Ph.D., and Hoover, D. H. Ph.D., (1994). *Fire Service Administration.* Quincy, MA: National Fire Protection Association.

Harrell, S. R., Scott, J. D., (1978, October). Alternative work schedules for firefighters: The 8-hour day. *Management Information Service Report*, Vol.10, No.10.

Heller, N. B. Ph.D., Stenzel, W. W., Gill, A. D., Kolde, R. A. (1976, July*). A guide to scheduling fire service manpower.* St. Louis, MO: The Institute for Public Program Analysis.

Hewitt, W. J. (1995, April). *Recreating the fire service*. Ottawa, Canada. p. 21.

Hill, D. W. (1997, January). *Call volume and shift scheduling options for Sioux Falls Fire Rescue.* (Applied Research Project). Emmitsburg, MD: National Fire Academy, Executive Fire Officer Program.

Hoetmer, G. J. (Ed.). (1996). *Fire service today: Managing a changing role and mission.* Washington, DC: International City/County Management Association, pp. 211-213.

International Association of Firefighters, (1997, November). *Fair Labor Standards Act Manual.* Washington, DC: Author.

International Association of Fire Chiefs, (1996, October/November*). Legal alert*. IAFCMIC: Fairfax VA: Author.

Karter, M. J. (1997, September/October). 1996 U.S. fire loss. NFPA Journal, pp. 70-82.

Krakeel, J. J. (1997, January). Following the agenda. Fire Chief, p. 31.

Martin, T. C. (1995, April/June). Adverse effects of rotating schedules on the circadian rhythms of air medical crews. *Air Medical Journal*, pp. 83-85

Maurno, D. A. (1996, February). The pros and cons of the "long haul". *Fire Station Management Advisor: Boston MA*, Vol. 6 No. 2.

Monk, T. H. (1989, April). Shift work and safety. *Professional Safety,* pp. 26-30.

Rose, R. J. (1991, August). Enhancing organizational efficiency through alternative scheduling. The Police Chief, pp. 60-63.

Rukavina, J. (1997, June). Fair Labor Standards Act still unsettled. *Fire Chief*, p. 30.

Rule, C. (1997, March). An alternative to the 24-hour duty day. *American fire Journal*, pp. 46-47.

Sheridan, P. (1991, November). Coping with your body clock. *Occupational Hazards*, Vol. 53, pp. 47-50.

Slapper, D. MD, (1998). Physicians should respect "internal clock". *ACEP News*: Author.

Townley, J. P. (1980, June). New shift schedule meets changing manpower needs. *Fire Chief*, p37-39.

Thomas, H. A. (1999). Circadian Rhythms and shift work. ACEP Online, http://www.acep.org/policy/pr4000166.htm.

U. S. Department of Labor, (1999). Police and firefighters under the Fair Labor Standards Act. Employment Standards Administration Wage and Hour Division. Washington, DC: Author. Fact sheet no. 008.

Westfall-Lake, P. (1997, October). Shift scheduling's impact on morale, safety, and performance. Occupational Health and Safety, pp146-149.

Westfall, P., McBride G. (1993*). Shift work safety and performance: A manual for managers and trainers.* West Columbia, TX: McBride Publications.

APPENDIX-A

Prevention
Rescue
Inspection
Disaster & Fire Control
Education
of the Community

Fire Chief Gary Frazier
Deputy Chief Kim Forbes

18 East Avenue B
Hutchinson KS 67501
316-694-2871

DATE: 6-1-99
TO: Joe Palacioz, City Manager
Patrick O'Neil, Local Union 179 President
FROM: Gary Frazier, Fire Chief
SUBJECT: Recommendations for Shift Scheduling Improvements

With the diversity of services offered, training requirements necessary, increased alarm loads, and the demand for efficiency and productivity by the public, it is necessary to constantly evaluate policies and procedures such as scheduling methods for efficiency, safety and productivity. Little research concerning shift scheduling has been done in Hutchinson since 1969 and several questions concerning productivity, health and safety of employees working extended hours, and efficiency have arisen. The purpose of this research was to explore and evaluate optional scheduling methods used by emergency agencies and compare the results to the current fire department schedule to determining the most efficient, safe, and productive means for scheduling operations personnel

This research attempted (1) to identify the main factors that impact or effect shift schedules, (2) to identify the most common types of shift schedules used by fire departments and other emergency agencies for operations personnel, (3) to identify the pros and cons of alternate schedules comparing them to the traditional 24-hour shift.

Results of the information revealed a variety of factors that impact shift schedules such as cost, call volume, hours worked, productivity expected, safety and health issues, and legal requirements, but the uniqueness of each department would suggest special considerations in determining the most optimal schedule. Although there are several alternate schedules being used in the fire service, the traditional 24-hour shift continues to be the most popular, cost efficient and only slightly less productive. Concerns with our current shift schedule are related to safety and health issues as a result of personnel working consecutive shifts, communication problems associated with the 4-days off after a set, and long time frames required for scheduling department training. Fatigue, which effects safety, is a concern with the 24-hour shift, however call volumes at his point are not as much as a factor as the working consecutive shifts without adequate rest. Reports on alternate shift schedulers indicate the rotating schedules necessary with 10/14-hour or 12/12-hour shifts can have a negative impact on the health and safety and is not a consideration.

Safety, efficiency in communication, and training, are areas that can be improved by implementing changes to the current schedule or by changing to a 24/48-hour schedule. After evaluating all pertinent factors, the 24/48-hour shift was found to be the most efficient, safe, and productive schedule for operations personnel in Hutchinson, however recent merger decision may delay any significant changes.

As a result of an upcoming merger involving the Hutchinson Fire Department and Reno County Fire District #2, a two-phase plan for scheduling improvements are recommended. Short-term recommendations will continue using the current schedule but focus on improving fatigue and safety by limiting the number of consecutive shifts worked. Long-term recommendations to improving fatigue, communications, and scheduling of training, will require implementing a change of schedule from the current 24-hour "California" method to a 24/48-hour schedule.

Short Term

- Continue to utilize the current modified 24-hour schedule.
- Modify the current "Call Back" and "Shift Exchange" policies to limit the number of consecutive shifts personnel can work to 3-shifts, based on the concern for personnel safety.
- Battalion Chiefs will monitor fatigue levels of personnel working call back or overtime and make changes when necessary.
- Increase communication among operations personnel by utilizing weekly written staff notes to the Battalion Chiefs.
- Attempt to schedule training when possible at times crews work three consecutive days.
- Address issue concerning the limitation of overtime and shift exchange.

Long Term

- Review and evaluate the results of the short term recommendations for effectiveness.
- If the evaluation reveals continued concerns in any of the areas, change the current modified 24-hour shift schedule to a 24/48-hour schedule.
- Address the issues involving a change of schedule.

Gary Frazier, Fire Chief